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Fact and Theory Papers.

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G. W. HAMBLETON, M.D.,

President of the Polytechnic Physical Development Society of Great Britain

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PREFACE.

AMERICA contains within her boundaries and in her history ample evidence in support of the case adduced in the following pages. Her great cities are the centres of consumption; and far away from them, on the borders of advancing civilization, "Nature's cures" have been frequently accomplished. A great advance in science has been made. We now know in what both processes consist; and the responsibility for the suppression of consumption rests with us.

GODFREY W. HAMBLETON.

LONDON, April, 1890.

THE SUPPRESSION OF CONSUMPTION.

WE have in consumption to deal with a disease that causes upwards of 60,000 deaths every year in the United Kingdom; and it is estimated, on the basis of three invalids for each death, that about 200,000 persons suffer from it within that period. This disease pervades all ranks of society, from the mansion of the rich to the cottage of the poor, and it attacks in its course childhood, youth, maturity, and old age. Can we suppress consumption,—a disease that has so wide an area of distribution, and that possesses such a fatal character? I have come, after due and careful investigation of the subject, to the conclusion that we can. The issue here raised is of immense importance. It is a question of life or death for hundreds of thousands; and I earnestly request careful consideration of the evidence I shall adduce in support of the case, which, I say, not only completely justifies, but also necessitates, the conclusion that we now have it in our power to suppress consumption. And I would at once note the fact that there is no essential reason why that should

not be accomplished. Man is not born to die from this disease, and, in fact, from four-fifths to six-sevenths of the race do not. We have unquestionable evidence that consumption has been completely recovered from, that a considerable reduction in its amount has been effected in some cases (for example, among prisoners), that it has been arrested for longer or shorter periods, and that persons with the signs of the disease have been able to completely escape from it:[1] consequently we must sooner or later ascertain the means by which that has been effected, and then we shall apply that knowledge to the prevention and cure of this disease.

What is the cause of consumption, and how does it operate in the production of the disease? The authorities have from time to time propounded theories that were said to give satisfactory information on these points. I take as examples of these theories the following:[2] climate, a certain height above the sea-level, cold, change of temperature, impure air, night air, carbonic acid, bad or insufficient food or clothing, dyspepsia, the non-assimilation of fat, diathesis, disease of the nerve-centre, cough, catarrh, bronchitis, pneumonia, pleurisy, dampness of the soil, inheritance, the *Bacillus tuberculosis*, etc., and ask, Does any one of them afford adequate information on these points? Submit them to critical examination, and the answer to this question is an emphatic negative;[3] for they either have no foundation in fact, or have for their basis conditions that, on the one hand, occupy so wide an area of distribution that they include within their

[1] Sydenham, Walshe, Laennec, Heitler, Roger and Boudet, Ewart, Frieund, Fuentes, Blake, Herman Weber, Cruveilhier, Pollock, Austin Flint, Fuller, Stokes, etc.

[2] Williams, Fuchs, Murrhy, Bouilland, Scot-Allison, Briquet, Boyle, Baudeloque, Bucheteau, Shephard, MacCormac, Ruehle, Herard and Cornil, Bouchardat, Bennett, Hutchinson, Brakenridge, Dobel, Lebert, Lugol, Allbut, Roberts, Memeyer, Clark, Williams, Broussais, Grisolle, Buchannan, Bowditch, Thompson, Cotton, Roberts, Koch, etc.

[3] Louis, Hanot (Jaccoud's Dictionary), Andrew, Pollock, Ziemssen.

sphere of action a large number of persons who have never shown any signs of the disease, and, on the other, are so limited in the field of the disease that they are only found associated with a greater or less number of its cases, and consequently can afford no adequate explanation of its cause and mode of operation. So obviously, indeed, is this the fact, that I shall only note a few of them in passing, and then examine in detail the important, because it is popular, theory of Koch.

Is consumption limited to, or even more prevalent in, any particular climate? No: the disease is co-extensive with the civilized world. Truly, consumption is more prevalent below than above certain altitudes, but within the same limits the vast majority of the human race is living free from the disease. Further, while on the one hand consumption is found at high altitudes, as in Madrid and in certain cities in South America, on the other it is unknown in certain tribes inhabiting districts below the sea-level in Asia. To cold and change of temperature has generally been assigned an important place. That is an error; for in cold climates, as in Canada, Sweden, and such places, as well as in the classes most exposed to cold, there is little consumption, and in the severe winter of 1854–55 more men died from it in the barracks at home than in the camp before Sevastopol; and a similar argument may be held with regard to the causal influence of change of temperature.

The majority of those who breathe impure air, night air, or who have bad or insufficient food or clothing, etc., do not get consumption; and the same fact holds good for the diseases that are alleged to produce it. What an appalling amount of consumption there would be if every one who had a cough, or who caught a cold, became consumptive! Dampness of the soil is another alleged cause of this disease, but in the cases cited in proof of that theory drainage

was not the only factor that was present. We know that as parts of Lincolnshire get drained, ague disappears, and consumption takes its place; and we have the same fact in America and in Switzerland.[1] There was the least consumption in the most wet department of France. Consumption is comparatively rare in pure wet, undrained districts, and a majority of consumptive patients have not been subjected to the influence of dampness of the soil. The theory of the inheritance of consumption is still generally accepted, although no evidence has been adduced in its support. At birth the child of consumptive parentage has the same type of chest, the same proportion of chest-girth to height, as that possessed by children of healthy parents, and there are no means of distinguishing the lungs of the one from those of the other. The fact that some of the children of consumptive parents subsequently themselves suffer from this disease is not evidence that consumption was transmitted from the parents to those children. A large number of children, even where both parents have died from consumption, remain absolutely free from it.[2] Is it so unreasonable to expect the conditions that produced the disease in the parents will later on repeat the process in those of the children that are submitted to their action, that we must resort to a pure hypothesis for an explanation of those facts? The theory is only alleged to account for a small part of the cases of consumption, and we cannot accept an hypothesis where we already have a reasonable explanation of the subject.

I pass now to the theory that the *Bacillus tuberculosis* is the cause of consumption, and I ask, What evidence is there to prove this theory? Koch[3] experimentally introduced the bacillus into a number of animals, some of which were in-

[1] Haviland, Kelly, Green (U.S.A.), Damaschind.

[2] Thompson.

[3] Report of Koch's Experiments (British Medical Journal), Watson, Cheyne, Spina (*Sutler*).

variably attacked by consumption, others had a greater or less liability to it, and the remainder were totally free from the disease. We have to examine the successful experiments. They were made upon animals that were most liable to "spontaneous" consumption, and their value rests upon the fact that the animals that were not inoculated were found healthy. Now, Koch himself noted, that, if these animals were kept too long before they were inoculated, they also became diseased. So there was only a difference of time between the inoculated and non-inoculated animals that became consumptive, and consequently the value of the so-called "control" evidence entirely disappears.

What produced consumption in the non-inoculated animals? According to the theory, the inhalation or other introduction of the bacillus. Just so; but where is there any evidence of that? The previous experiments do not prove that the bacillus can produce consumption, and to offer that explanation is to assume the precise point the experiments were intended to prove.[1] Further, these animals were subjected to the conditions of confinement. What effect did those conditions produce on the animals? Koch ignored them and their effects, and by so much vitiated his conclusion, even if that conclusion had been otherwise established. The bacillus, its containing medium, or the changes effected, were evidently powerfully irritant; and it would indeed be surprising if, when introduced into animals so liable to consumption and subjected to the conditions of confinement, the disease were not both more rapidly manifested and of a more extensive character. Therefore Koch's experiments do not in any way warrant the inference he has drawn from them; and once again a great discovery has had its true import temporarily overshadowed by a misinterpretation of its real significance.

[1] Cadeal and Malet's Experiments (British Medical Journal), Brown-Sequard's Experiments (Lancet).

How does this theory accord with the known facts of the case? Tubercles in various stages, young and adult, are found in which there are no bacilli, while in the same specimen caseous tubercles may be present containing bacilli.[1] There are cases of consumption in which the bacillus is absent both during life and *post-mortem*.[2] The physicians, clinical clerks, nurses, *post-mortem* room attendants, and those who clean the wards of consumptive hospitals, are not attacked by the disease.[3] Patients suffering from bronchitis, pneumonia, etc., occupy beds adjoining consumptive patients for long periods, but they do not become consumptive. The friends of patients who regularly visit them in these institutions do not get it. Some wards at Brompton had their ventilating-shafts stopped, but no attack of consumption followed either in the patients suffering from other chest complaints or in the attendants.[4] These institutions are not centres from and around which the disease spreads. Yet here are the most favorable conditions for its rapid and unquestionable propagation; and we have only to substitute small-pox, scarlet-fever, or any of the infectious diseases for consumption in the above conditions to realize what must happen if it were an infectious disease. And so widely is this bacillus distributed, so tenacious is it of life, and so constantly are we, especially when suffering from respiratory diseases, exposed to its action, that on the assumption of its potency it is impossible to account for the comparative smallness of the number of consumptives.

We pass from these contradictory and most unsatisfactory theories to the consideration of one that is both in strict accord with and capable of affording an adequate explanation of all the known facts of the case. The theory my investigations have led me to hold may be stated as follows: that

[1] Klein.
[2] Pollock, Cotton, Andrew.
[3] Spina, Sir Andrew Clark.
[4] Pollock.

consumption is the direct result of the reduction of the breathing surface of the lungs below a certain point in proportion to the remainder of the body, and is solely produced by conditions that tend to reduce the breathing capacity.

I have experimentally produced consumption by these conditions. On one occasion I took a well-developed chest, and gradually submitted it to conditions that tend to reduce the breathing capacity, and at the same time, so far as possible, placed impediments to the performance of compensatory action by other organs. At first there was a reduction of the chest-girth, a wasting of the muscles, a loss of the range of extension, the well-known change in shape, and increased frequency of breathing. This was soon associated with catarrh, pain in the chest, steady loss of weight, and hectic; and the process was continued until I was satisfied that consumption was well established. Then I induced compensatory action by other organs, and submitted the lungs to conditions that tended to develop them. This was followed by great relief in the chest symptoms, which eventually completely disappeared, by a restoration of the general health, a return to the normal weight, a change in the shape of the chest in an opposite direction; and I continued the process till the chest had regained its full development and there was sound health. Each step in the experiments was carefully verified, the same sequence of events was invariably observed, and I have both traced the presence of these conditions and watched their progress in many cases of consumption.

We can at any time watch the direct production of consumption by the constant inhalation of small particles of various substances in strong healthy men who have been brought up in the country, and we know the disease has been produced in this way for generations. Masons, builders, wool and cotton manufacturers, quarrymen, cutlers,

file-makers, earthenware manufacturers, etc., supply a large contingent to the mortality from consumption.[1] Occupations that are carried on in small, crowded, or badly ventilated rooms, where the respiratory functions are impeded, or those in which there is a long-continued cramped position of the chest, have long been notorious for the production of consumption. We have examples of this in the case of Manchester warehousemen, drapers, tailors, shoemakers, watchmakers, printers, clerks, and students.[2]

The army supplies us with a practical demonstration of the direct production of consumption by such conditions. Each recruit is specially examined with reference to consumption, and three months after he has entered the army he is again examined, when, if any indication of the disease be found, he is at once dismissed the service. These men are placed under the supervision of skilled medical officers; their food, clothing, and home are assured them; they are in the prime of life; and any illness they may have is at once attended to. Yet, notwithstanding this doubly certified freedom from consumption, and these great advantages, the loss to the army from this disease is much higher than that of the worst district in England. During the six years 1880-85 there were, on an average, 1,330 admissions into hospital, 263 deaths, 215 invalids sent home from abroad, and 474 invalids discharged the service. Army medical authorities[3] are agreed in attributing this "generated" disease to the conditions of army life; and of these they attach most importance to the large amount of time spent in impure barrack air, compression of the chest by clothing, etc., alcoholism, sentry go, and specific disease, or, in other words, to conditions that tend to reduce the breathing capacity.

[1] Lombard.

[2] Supplement to Registrar-General's Report, 1870-80.

[3] Parkes, Aitken, Welch.

We have in confinement[1] another practical demonstration of the direct production of consumption by conditions that tend to reduce the breathing capacity. Prisoners, orphans, and the insane formerly suffered terribly from this disease. At one time the mortality of the white prisoners of New York from consumption was three times that of the population, and the mortality of the black was double that of the white prisoner.

In the so-called "inherited" consumption there is yet another sad example of the direct production of the disease by such conditions. Look, on the one hand, at the conditions under which these children are brought up from birth, at the early age at which the disease appears, at its greater frequency in the daughters of consumptive mothers, and, on the other, at the plain evidence of the effect of these conditions that is seen in the arrested or retarded development of their chests.

Strong healthy countrywomen, who were accustomed to work in the fields, went to Paris, wore stays for the first time, and furnished the majority of Louis' patients. Tall men, who in proportion to their height are small-chested, and narrow-chested men, are notorious for their great liability to the disease. The association between repeated injury to the lungs by certain diseases and consumption has attracted the attention of most observers. We know that our cities are the chief centres of consumption, that the main tendency of city life is to reduce the breathing capacity, and that men who have been brought up in the country supply the majority of its victims. We also know that in the country such tendencies dominate the sphere occupied by the women who are liable to this disease, and that the female mortality exceeds that of the male.

Further, we have the same relationship between these

[1] Laennec, Cruveilhier, Peter.

conditions and consumption in the animals under our control. Many investigators have produced consumption in animals by strict confinement.[1] Wild animals kept in the great national menageries, cows stabled in cellars under ground in large cities, and our own domestic pets, alike become its victims. And where is there a case of consumption, experimental or not, in which such conditions were absent?

I have carefully sought in vain for the record of such a case. Now, if the interpretation that has been placed upon these facts is true, then we shall find ample evidence of the action of those conditions in the disease itself. They tend to reduce the breathing capacity: consequently their effect must be a progressive reduction of the breathing surface of the lungs, and that is precisely what we have. Long before we get the so-called signs of the disease, we have a progressively lessening chest capacity, that goes[2] on to the end. I have shown, I trust not too briefly, that conditions that tend to reduce the breathing capacity can and do produce consumption, and that they are the dominant factors of, and co-extensive with, the field occupied by this disease. Let us now glance at the dominant conditions of the field in which consumption is unknown: for there are still places in Asia, Africa, and America in which there is no consumption; and in some of these the inhabitants have no word for the disease, and do not know what it means. Travellers inform us that these people spend the whole of their lives in active exercise in the open air, that they hold themselves erect, bearing the weight of their shoulders on the spine, and that their chests are broad, deep, and freely movable. And there is no record of consumption being found in animals in their wild state.

[1] De Musey, D'Arboval, Rayer, Bricheteau.

[2] Hutchinson, Stokes, Ransome, Graham, Balfour.

But this area of freedom from consumption is being steadily diminished by the introduction of civilization,—that is, of conditions that tend to reduce the breathing capacity,—and that is invariably speedily followed by the first appearance of the disease. The native races of America were free from consumption till they came in contact with Europeans, and began to adopt their habits and mode of life; and the amount of this disease actually present in the American Indians has recently been shown to correspond with the extent of their civilization.[1] So, also, were the South Sea Islanders, the Maories, the New Britons, and the natives of the African coast. The same process is now marking the progress of civilization among the natives in the interior of Africa, Asia, America, and New Britain. We have the same sequence of events in the great mortality of the dark races that settle in our cities and large towns; and in civilized countries the classes that were formerly free from consumption, for example, mountaineers and our own Highlanders, are now being attacked by the disease, as the direct result of a corresponding change in their habits and surroundings.

What is the mode of operation of the conditions that tend to reduce the breathing capacity in the production of consumption? In a true state of health the lungs have a sufficient breathing surface, not only to perform their ordinary functions, but also to meet within certain limits any extra demand that may be made upon them. When they are subjected to conditions that tend to reduce the breathing capacity, they lose this power of adjustment to their external conditions, and subsequently become unable to effect the whole amount of those interchanges that constitute their ordinary function. That part of those interchanges that is not effected by the lungs, being necessary to meet the ordinary requirements of the body, will be at once added to the

[1] Rush (Philadelphia), Science (New York).

work normally performed by one or more of the other organs; and, so long as this compensatory work is accomplished without causing a disturbance of their functions, a temporary adjustment will have been effected, and there will be no obvious disturbance of the general health. But unfortunately these conditions continue in active operation, there is progressively increasing reduction of the breathing capacity, and consequently there comes a time when this compensatory work is not effectively performed by other organs, and there is either a greater pressure of work thrown on the lungs, or over-activity of one or more of the other organs, indicated by some mode of disturbance of the general health.[1] The imperative demand for the effecting of these interchanges causes in the parts least able to meet it, as a rule the apices, the phenomena of irritation, which is, as we know from the experimental production of tubercles by irritation,[2] manifested by tubercular change. Each point of these morphological changes produces a further reduction of the lung capacity, and by so much becomes an addition to the forces that increase the inequality between the amount of lung available and the amount of work it has to perform; and so there is more irritation of the lungs, and more work thrown on the other organs, disturbing their functions and deranging the general health. Further, as the foci of morphological change multiply by reason of the progressive increase of the conditions that produce them, there is increased pressure and lessened supply of nutrition, accompanied by local congestion; so that they become deprived of nutrition, necropsis takes place, and eventually cavities are formed. Hence there is more and more work thrown on the other organs, causing increasing disturbance of their functions, and consequently more and more disturbance of the

[1] Pollock, Hanot (Jaccoud's Dictionary), Ruehle (Ziemssen's), etc.

[2] Wilson-Fox, Sanderson, Simon, Cohnheim, Frankel, etc.

general health, till first one organ and then another becomes so greatly deranged that the so-called complications of the disease are produced; and this process goes on till at last neither lungs nor the other organs are together able to effect those interchanges without which life cannot continue.

Glance for a moment at the course of consumption when viewed in the light of this interpretation of its nature. Instead of its "uncertain and mysterious" advent, its "protean" forms and "chameleon" changes, we now see before us a perfectly natural succession of events, whose *raison d'être* order of sequence and relationship to each other can be laid down with exactitude. We have, in the first place the lowered or arrested vital capacity progressively decreasing, associated with a progressive decrease or arrest of the size and extent of movement of the chest, the wasted or non-developed muscles, the sloping shoulders, and the changing shape of the thorax. At a certain point in this course there appear occasional, and then frequent, indications of increased activity of one or more of the other organs; there is increasing liability to "catch colds," and increasing difficulty in getting rid of them; and there are signs of the derangement of the general health and increasing weakness, accompanied by indications of lung irritation and implication. This may be followed by a period of rest; there has been a temporary adjustment between the work to be done and the work effected; and in common parlance the patient has been "patched up," if he is under treatment. Then the area of lung implication spreads, the signs of lung irritation become more marked and troublesome, the general functions are greatly deranged, the appetite fails, the body-weight seriously decreases, hectic is present, and the patient's rest is disturbed. This also may be followed by a period of rest, a balance having been effected between the work now required and that accomplished. And these periods of attack and rest go

on, the attacks increasing and the rests disappearing, until so much destruction has been effected that the body is no longer able to resist the disease, and death terminates this unequal combat.

Whatever condition of man's habits, mode of life, and surroundings has a tendency to reduce the breathing capacity is a potential cause of consumption; and it is an active cause in its production, unless and until its action is counteracted or compensated. It is evident that we have not to deal with the mere temporary or accidental presence of such conditions, but with those only that have a continuous or permanent character. We may consider these conditions from the point of view of whether their tendency is expressed by disuse of the lungs or by their forcible compression or injury. The most important place in the former must be assigned to the rapidly decreasing amount of muscular exertion we require to make in order to supply ourselves with those things that are necessary for our daily wants, owing to the increasing facilities for obtaining them afforded us by means of machinery and railways. This lessened demand for muscular exertion to obtain our necessaries creates an inability and distaste for exertion to obtain those things that are not necessary; and, as there is a consensus of opinion on that point, it comes to be considered "not the correct thing" to perform any of those acts that require such exertion. Who carries any thing that he can have sent, or walks when he can ride? Who does not now ride in a closed carriage in preference to performing the journey on horseback? An obvious effect of this change is to increase the time spent in houses, manufactories, and offices, and consequently to greatly decrease that spent in the open air. Not only does man spend much more time in his habitation, but also those habitations have materially altered in character. Our sleeping apartments are no longer

open to a thatched roof, our doors and windows are made to fit more accurately, and for the wide, open fireplace of our fathers we have substituted the modern grate, which appears to be kept closed on every possible occasion. In a word, the resources of civilization have been used to obtain as much difference as possible between the air in which we now pass the greater portion of our lives and that we have to breathe when out of doors. Whatsoever part of the twenty-four hours is spent in a house is so much time during which the movement of the lungs is impeded, for while there we are generally either sitting down or reclining; and both positions tend to reduce the breathing capacity, the latter more than the former. Also, as there is little muscular exertion in the house, there is a lessened production of heat, for which artificial heat is substituted; hence the great difference between the temperature of the rooms and that of the external air, the great sensitiveness to a lower temperature, and the fear of catching cold. This fear of cold leads to active measures being taken to prevent cold air entering the rooms, and consequently to bad ventilation. And this hyper-sensitiveness to cold tends either to keep us in-doors during the colder months of the year and on those days during which the temperature is lower than usual, or to induce us to so overload the body with clothes when we do go out that free movement of the lungs is impeded.

The habit of stooping, whether brought about by the shape of the chairs (they are admirably adapted for that purpose), by the habit of assuming a so-called easy position, by muscular disuse and consequent weakness, or by poring over books from the nursery through the whole course of modern education, tends to materially reduce the breathing capacity. Very efficacious in the production of chest reduction is the universal custom of both sexes to have their clothes made to exactly fit the body at a period of rest, and thereby effec-

tively preventing any but the most limited movement. Does not this custom effectually check any tendency to movements that would necessitate more than ordinary, tranquil breathing? And have we not enforced this habit by penalizing its breach as indicating a want of *savoir vivre*? Fashion dictates the size and shape of our clothes, and our bodies have to and do conform thereto. A beautiful example of this is seen in the hideous distortion of the lower part of the chest produced by wearing a corset, that never, never is tight. The compression thus produced is one of the most powerful causes of consumption in young girls and women; and obviously whatever produces either forcible compression of the chest or direct injury to the lungs is a cause of consumption. And when we look at the position such conditions hold in civilization, at the advances that are being made by man's increasing knowledge of the operations of nature, and his application of that knowledge to his own purposes, and at the progressive increase of such tendencies, then we see that in consumption we have one of the processes by which an adjustment is being made between the body and the work it has to perform under the changing conditions of advancing civilization, by the removal of those who have a body in excess of that work, and that the survival of the so-called fittest is thereby effected.[1]

Chest Development.

The first step in the practical suppression of consumption is to take those measures that are necessary to reduce its production to insignificant proportions; that is, we must secure the effective prevention of the disease. We shall attain this object by seeing that, on the one hand, we have or obtain such an amount of lung surface as is adequate not only to perform the ordinary work that is demanded of it, but

[1] Pritchard, Lamarck, Darwin, Spencer.

also to meet, within certain limits, any extra demand that may be made upon it, and, on the other, by so arranging our habits, mode of life, and surroundings, that their tendency as a whole is to develop the lungs. What amount of lung capacity is necessary to conform to the above requirements? Hutchinson's so-called standard of vital capacity is too low. The lungs of a man having a chest-girth ranging between Brent's "medium" and "maximum" standards, with an extent of movement of four inches and upwards, would give the required amount of lung surface. I give these standards in the following table:—

Height. Ft. In.	Medium. Inches.	Maximum. Inches.
5 1	34.56	40.66
5 2	35.01	41.33
5 3	35.70	42.00
5 4	36.26	42.66
5 5	36.83	43.33
5 6	37.40	44.00
5 7	37.96	44.66
5 8	38.53	45.33
5 9	39.10	46.00
5 10	39.66	46.66
5 11	40.23	47.33
6 0	40.80	48.00

It will be found, on examination, that many of us do not possess the standard of chest development; and if we would be certain of absolute freedom from the possibility of an attack of the disease, then we should deliberately set to work to obtain this development. There is no difficulty whatever in doing that, for the size and shape of the chest depend upon the conditions to which it is subjected.[1] To develop the chest we must avoid those conditions that tend to disuse of the lungs, to their compression or injury, and introduce others that markedly tend to develop the lungs. If possible,

[1] "What is Consumption?" (1886); "The Experimental Production of Chest-Types in Man," British Association, 1887, Statistics; "Physical Development;" The Illustrated Medical News, Nov. 9, 1889.

the residence should be situated in the country, in a healthy suburb, or in a wide, open street. The rooms, and especially that used as the sleeping apartment, should be lofty, capacious, well lighted by windows that open, and ventilated by direct and continuous free communication with the external air, summer and winter, night and day. Gradually lower the temperature of the rooms till there is not nearly so much difference between it and that of the external air as that to which we are now accustomed. Great care should be taken about the clothing of the body. It is essential that the clothes should be made so loose that they offer no impediment to the full and free movement of the chest. When ordering clothes, be sure the measurement is taken at a full inspiration, and see that they are quite easy even then. Don't use braces, corsets, or respirators: they tend to impede the respiratory movement. Wool manufactured in such a way that it is elastic and permits free ventilation should be worn next the skin; and the under-linen should be frequently changed, so that no impediment is offered to its emanations. A sponge-bath should be taken every day. Low-heeled boots, wide, broad toes, should be worn, so that walking exercise may be taken in comfort.

Spend as much time as possible, and that daily, in some form or other of active exercise in the open air. Carefully avoid the habit of stooping: throw the shoulders back, the chest forward, and get into the habit of holding the body erect at all times. Breathe through the nose, and take half a dozen deep inspirations, followed by full expiration, several times daily. Go in for gymnastics, giving special attention to the development of the muscles of the chest, swimming, singing, and athletics, and get gradually acclimatized to the external air, wind, and rain. Don't overload the body with clothes; and maintain the temperature in the natural way,

by increased muscular exertion. Get the chest-girth and vital capacity taken at regular periods, and record them, so that you may know what progress you are making; and do not relax these efforts for a day until the chest-girth at the nipple line is higher than Brent's medium standard.

The members of consumptive families and those who bear the marks of threatened disease—a narrow chest and faulty carriage of the body, associated with some indication or other of deranged health—should make it the first business of their lives to carry out the above directions. Till that has been accomplished, it is worse than useless—it is certain disease—for them to engage in sedentary, chest-constricting, or dust-inhaling occupations. Those who are engaged in such occupations, or who are unavoidably submitted to surroundings that tend to reduce the breathing capacity, should most scrupulously devote sufficient time daily to one or other mode of developing the lungs, in order to counteract their effects. And I need not point out that considerations of self-interest, of humanity, and of public policy, alike demand that a practical effort should now be made to reduce the compression of the chest, the inhalations of small particles, and confinement, especially in rooms under ground, to a minimum in those trades.

At birth the child has a proportion of chest girth to height that slightly exceeds that of the maximum standard. I have suggested the birth standard as the true standard of health; but under the present system of bringing up children, they are, from the moment of birth right through the whole course of modern education, submitted to conditions that tend to reduce the breathing capacity; so that for a height of 51.84 inches there is a chest-girth of 26.10 inches, instead of one of 35.18 inches, or a loss, in about ten years, of nearly nine inches. And when there is consumption in the family, extra care is taken of the children; that is, these

conditions are pushed to an extreme limit, and the so-called inherited consumption is the direct result. Here you have the best standard of chest-girth. Is it too much to ask that the conditions of the child's surroundings as a whole shall be so arranged that it may be retained? Look at the poor, puny chests we meet with, and at the reports of the registrar-general, and then we shall see the grave responsibility that lies upon us for producing such a change, and permitting it to continue.

I have pointed out the means by which we can develop the lungs to the required standard, and in so doing have shown how that development is to be retained, and consumption be effectually prevented. These measures are very simple; and in one form or other, and at some period or other within the twenty-four hours, they are within the reach of all. But they effect a complete change in our habits, mode of life, and surroundings; and a change of this nature must be slowly, gradually, and cautiously effected. I warn you against stretching the lungs (that is not development), against violent or sudden exertion and exhaustion. Uninterruptedly, step by step, acclimatize the bodies to the new conditions, and then they will lead us safely and surely to complete protection from consumption.

Treatment.

How can we reduce the mortality from consumption to insignificant proportions, and so complete the measures that are necessary to secure the practical suppression of the disease? This is the state with which we have to deal. The lungs are being progressively destroyed by a process of irritation[1] caused by more work being thrown on them than they are able to effect;[2] and this inability has been produced

[1] Tanner, Aitken, Wilson-Fox, Waldenburg, Schottelius, Roberts, Lombard, Marcet, Sanderson, Simon, Cohnheim, Frankel, Rindfleisch, Niemeyer, Powell, Ewart.

[2] Gautier, Peter, and the French School.

by their having been, and still being, subject to conditions that tend to reduce their capacity;[1] and, further, during the progress of these events, the other organs have become involved by attempting to perform compensatory work, with the result that the general health is more or less seriously compromised. Consequently, in order to adequately deal with this state of things, we must treat consumption upon the following principles: to establish an equilibrium between the amount of interchange required to be effected and that effected; to enable the other organs of the body to perform their ordinary functions; to restore to the lungs their power of adjustment to their external conditions; and to obtain the above without producing indications of friction: that is, in other words, we must arrest this process of irritation, restore the general health, and develop the lungs to the required amount, in order to secure complete recovery from consumption.

A little consideration will make it evident, that, to carry out the first principle of treatment, we shall have to take measures from two distinct points of view. On the one hand, the conditions that impede the effecting of these interchanges must be, as far as that is possible, removed, and those that have an opposite tendency substituted; and, on the other, any deficiency that may remain must be made good by the compensatory action of one or more of the other organs. For this purpose we shall, in the first place, put the patient under conditions of habitation, habits, and surroundings that tend individually and collectively to promote these interchanges. The consumptive patient must be sent as soon as possible to live in a house the sanitary condition of which has been ascertained to be good, situated on an elevation, either in the country or at the seaside,

[1] Graham Balfour, Gintrac, Hanot (Jaccoud), Hutchinson, Fabino, Wintrich, Hecht, Schnievogt, Waldenburg, Ransome, Stokes, Frieund, Aitken.

where the air is pure and free from dust. Each room must communicate continuously and directly with the external air. Sunlight should be freely admitted; the windows constantly kept open, night and day; and the temperature, as recorded by a maximum and minimum thermometer, gradually lowered till there is not so great a difference between it and the external air as that we still find in the rooms of consumptive patients. The patient's clothes must be warm, not too heavy, and made so loose that they can offer no restraint to the free movement of the chest. Wool manufactured in such a way that it is elastic, permits free ventilation of the skin, and is not too heavy, should be worn next the body; that used during the day must not be worn at night, and the under-linen should be frequently changed.

As much time as possible must be spent in the open air. If the patient is unable to walk, he should ride or drive in an open carriage till he has gained sufficient strength to enable him to do this. Sitting in a position that tends to impede the movement of the thorax must be carefully and constantly avoided, and the patient should be gradually induced to throw the weight of the shoulders on the spine till he both sits and walks with the body erect. If any deficiency remain,—and that, as well as its amount, will depend upon the extent of the disease,—we shall have to obtain compensation for it by measures that increase the activity of the functions of the skin, or the kidneys, or the alimentary canal. To increase the functional activity of the skin, we shall direct the patient to be bathed or sponged with warm water, medicated or not, as frequently as may be found desirable, once daily in any case; and, if necessary, we shall increase that activity by prescribing diaphoretics. If the action of the skin obtained by the above measures be not sufficient for the purpose, or if it be already performing its

share of this compensatory work, then we shall increase the activity of the kidneys by suitable diuretics, and attend to the functions of the alimentary canal. Now, the above measures, thoroughly and carefully carried out, will, if the disease be not too extensive, effect an equilibrium between the work required to be effected and the work effected, and we shall have obtained an arrest of the disease.

The first step towards enabling the other organs of the body to perform their ordinary functions has been already taken by removing that which was the primary cause of their derangement; viz., the presence in those organs of substances that interfered with their normal work, and altered, to a greater or less extent, the state of their nutrition and that of the body as a whole. We shall supplement that, where necessary, by appropriate means to secure the relief of any organ that may have become involved by its compensatory action, and to obtain the normal functional activity of the others, so that the body may be placed in a fit state for the reception and assimilation of suitable food.

The nature and quantity of the food, and the time for its administration, must be carefully regulated according to the requirements of the case, but care must be taken not to give it too frequently or in too large quantities. I attach much importance to the careful cultivation of the appetite, so that the patient may be tempted to eat, and to the careful avoidance of any dish or article of food to which the patient has taken a dislike. Good new milk alone, or made up in various ways, cream, butter, olive-oil, marrow (I have found great benefit from a preparation of marrow and malt immediately after the meal), hot bacon with its fat, eggs, good beef-tea, soups, fish, fowl, cutlets, fillets, etc., with a suitable supply of vegetables and fruit, must be freely drawn upon for the patient's food. And we may add to this a good

bitter beer, stout, or a good, sound claret, or wine, when we are sure we can get them.

No attempt whatever should be made to apply the third principle of treatment until the disease has been some time arrested, as shown by a progressive decrease of the symptoms of lung irritation, an increase in the area of breathing, increased vital capacity, extent of movement and girth, a nearly normal temperature, a steady improvement of the general health, and increased weight. Then the following measures may be gradually adopted and steadily increased, great care being taken to avoid either strain (the lungs must not be stretched) or over exertion, the state of the general functions and temperature being carefully watched. We place the patient under conditions that progressively make increasing demands for the use of the lungs, such as slight ascents on the neighboring hills, slowly performed at first, and then gradually increasing both the elevation and the time occupied in such exercise. Deep breathing is to be regularly practised, commencing with three or four full inspirations, followed by deep expirations, in succession, and increasing both their number and extent. I have found the careful and regular use of a spirometer very beneficial, and much regret that, as in the case of thermometers, no one as yet supplies them at such a price as will enable the general public to purchase them. Then the muscles of the chest must be fully developed, and the patient should take part in such exercises as will insure their full use. And this process of lung development will not be complete until the patient's vital capacity exceeds Hutchinson's so-called standard of health.

And we shall attain the object of the fourth principle of treatment by carefully selecting appropriate measures to effect each purpose we have in view (and the medicines must be prescribed precisely on the same principle; for instance,

if we desire to increase the functions of the skin, a diaphoretic is prescribed, and its use stopped when we desire such action to cease), by using them at the right time and to the right extent, and by carefully watching their effects, so that if there be any indication of friction we may at once effect the necessary modification, or adopt some other means to attain the same object.

Under this system of treatment, the chest symptoms are immediately relieved; pain, cough, and expectoration speedily disappear; the area of breathing, the vital capacity, the chest-girth, and extent of movement, progressively increase. The temperature tends towards that of health, the general state improves, the weight increases, and there is a feeling of health and strength. In fact, so real is this, that it has been the source of one of the chief difficulties of treatment, by tempting the patient to do something beyond his strength, or to neglect some of the directions given him, till he finds himself promptly pulled up by a cessation of his improvement.

Soon, in those cases in which the disease is not extensive, there is a complete arrest of the disease, no chest symptoms, a good state of the general health, a fair weight, normal temperature, a good breathing capacity, and eventually the patient makes a complete recovery. By this I mean he has the appearance and possession of sound health, natural breathing from base to apex, a well-formed and fully developed chest, and a good range of movement and vital capacity.

The Evidence.

I have based this statement on the results I have invariably obtained in my experiments, and in the practical treatment of the cases of which the following notes appeared in the *Lancet* of Nov. 26, 1887, and Dec. 8, 1888, and in the *Illustrated Medical News* of Oct. 26, 1889.

"CASE I.—In April, 1883, I saw H. O. M. E., a married lady, in conjunction with the gentleman who had attended her. We found the usual signs of phthisis of the right lung. Family history good; height 5 feet 2 inches; vital capacity 85 cubic inches. I accompanied the patient to Hastings, and saw that she was carefully treated on the principles I advocated in that paper.[1] June 13, much improved; vital capacity 130 cubic inches. June 21, improvement continues; now able to walk a mile or two; vital capacity 162 cubic inches. June 29, able to walk four miles; vital capacity 167 cubic inches. The patient was unfortunately obliged to return to town. The improvement stopped, and after a few weeks she began to lose ground. In September the patient went to the Isle of Wight, the vital capacity then being only 161½ cubic inches. Oct. 9, very much improved; vital capacity 195 cubic inches. She continued in the south, and was gradually accustomed to walk many miles daily; no chest symptoms. Nov. 4, patient's appearance that of a lady in good health; vital capacity 201½ cubic inches. Nov. 25, continues well; vital capacity 222½ cubic inches. Dec. 11, patient has recovered; angles of scapulæ lie flat on back, chest freely movable, and vital capacity 226 cubic inches, or 44 cubic inches above the so-called standard of health. Since that date the patient has had two children, there has been no relapse, and in September last her vital capacity was 220 cubic inches.

"CASE II.—L. J. F. was said to have disease of the right lung by family doctor. The patient's father and uncles had died of consumption. I found the disease very limited, and the case a most favorable one to treat. Height 5 feet 6 inches; chest-girth at third rib 30 inches; extent of movement ½ inch; girth at ensiform cartilage 29 inches, extent

[1] "The Scientific Treatment of Consumption," Manchester Meeting of the *British Association*.

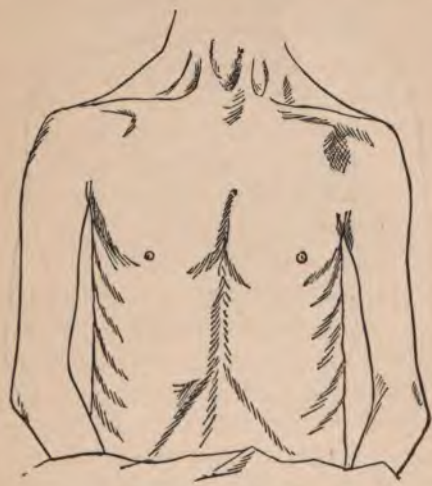
of movement 1¼ inches. Treated on the same principles, the patient steadily and rapidly improved. Two months later the chest-girth at the third rib was 32½ inches, extent of movement 1⅝ inches; girth at ensiform cartilage 30 inches, extent of movement 3 inches. Two months after the above, the patient had practically recovered. There was

a further gain of half an inch in girth; no depression above or below clavicles; angles of scapulæ flat, and weight 9 stones 5 pounds. The patient continues well.

"CASE III.—This was a servant, with disease of both lungs. The patient was sent home to the country apparently recovered, and desired no further attendance. I have since lost sight of her.

"CASE IV. is that of myself. It will be fully understood that I only refer to it to complete the *prima facie* case I have established in support of this method of treating the disease. My mother, her three brothers, and two sisters died

of phthisis. In physical appearance I was a well-marked example of the so-called 'inherited' disease. Height 5 feet 9½ inches; vital capacity considerably below the so-called standard; was always subject to winter cough; broke down while attending hospital in 1873, and was advised to leave at once, in the middle of the session. There was no doubt about the nature of the disease. Since that time I have gained about five inches in chest-girth, and for ten years



have been free from any sign, symptom, or appearance of the disease.

"I shall be obliged if you will enable me to state that those patients continue well, notwithstanding the severity of last winter, and that their remarkable increase of chest-girth and range of expansion has been retained. Since then, I am sorry to say, I have only had an opportunity of applying those principles of treatment in two cases.

"The first case was an acute attack, temperature over

102°, in a case of long-standing and very extensive disease of both lungs. Under treatment, the temperature became nearly normal, cough and expectoration nearly disappeared, breathing became easy, the chest-girth increased, and in about six weeks the patient returned to work. A short time since, I heard that the patient was fairly well, and still able to continue at work; and, had there been a home placed under conditions suitable for treatment, I think this case would permanently recover, notwithstanding the extent of the disease.

"In the other case there was extensive disease of the right, with commencing disease of the left lung, and hectic. The patient could not leave his business, but carried out the directions so carefully that cough and hectic disappeared; the appetite was good, weight increased, and there was no difficulty in breathing on exertion. In fact, he felt and looked so well that he spent a day at Wimbledon, got thoroughly wet through in the camp, and remained in his wet clothes. That brought on an acute attack, and his temperature rose to over 103°. Under treatment, this was rapidly recovered from, and in three weeks he was fit to go, and went, to the Highlands. During the attack the patient lost eight pounds in weight; the heart was displaced to the right; and the chest-girth at ensiform cartilage was, on expiration 27½ inches, and on inspiration 28⅝ inches. The patient has no trouble with cough; the color is healthy; temperature nearly normal; weight has increased 12 pounds; heart has gone back; chest-girth at ensiform cartilage is, on expiration 28 inches, on inspiration 30½ inches; and there is no difficulty in breathing or cough when the patient runs."

"The cases previously reported continue well. Of the two cases which were noted in the *Lancet* of Dec. 1, 1888, one (Case 5), I understand, continues at work, and the other

(Case 6) has had a most instructive record. This patient went through the winter very well, and I did not see him till the 29th of May, when, as the direct result of recent overwork in his business, I found he had materially lost ground, but unfortunately he could not leave town. A sharp attack of hæmoptysis came on on the 29th of June, and I was sent for. The temperature rapidly rose to 103°, but was promptly reduced, the hemorrhage arrested, and in a few days the patient was up. He left for the Highlands on the 19th of July, when his chest-girth was, on inspiration 30⅝ inches, and on expiration 30¼ inches, the extent of movement being only ⅜ of an inch. I next saw him on Oct. 3, his chest-girth being, on inspiration 32 inches, expiration 30 inches, showing an increase of 2 inches. This was associated with a considerable improvement in the local and general state, weight 9 stones 4 pounds, and I am well satisfied with his progress.

"Case VII.—On May 21 first saw this patient. Father and his brothers had died from consumption. Occupation dust-inhaling; liable to colds, slight cough, hectic, frequent diarrhœa, voice changed, and face pale; height 5 feet 5¼ inches; chest girth at ensiform cartilage, on inspiration 27½ inches, expiration 25 inches. Commencing disease of right lung. June 26, appetite fair; air entering more freely; chest-girth, on inspiration 28½ inches, expiration 26 inches. July 24, looks very well, sleeps well, appetite good, no cough, voice natural, temperature normal, air entering freely everywhere, good movement; chest-girth, on inspiration 29¾ inches, expiration 27 inches, showing an increase of 2¼ inches. The patient has practically recovered. Still well.

"Case VIII.—Patient's mother's family consumptive. Dust-inhaling occupation. Has had cold upon cold, pale, appetite bad, fingers clubbed, pain over middle of third right rib, cough troublesome; temperature 99.1°. Disease of both

lungs. Height 5 feet 9¼ inches; chest girth, on inspiration 36¼ inches, expiration 33¼ inches. June 18, says he is first-class, looks better, appetite good; no cough, no pain in chest; air entering freely, more movement, apices higher; and chest-girth, on inspiration 37¾ inches, expiration 35 inches. July 17, sleeps well, eats well, and looks well. Temperature normal; weight 10 stones 9 pounds; no pain, no cough, no expectoration; air freely entering everywhere; and chest-girth, on inspiration 38 inches, expiration 34¾ inches, being an increase of 1¾ inches. Patient has nearly recovered, and returned to work. Continues well.

"CASE IX.—This patient has been getting thin, feels weak, pale, and appetite capricious. Occupation in a basement partly lighted by gas always. Commencing disease of left lung, breathing generally feeble, and very little movement. Temperature 96.6°; height 5 feet 8 inches; chest-girth, on inspiration 35 inches, expiration 32 inches. Aug. 29, says he feels quite well, and looks it; air entering freely everywhere, movement good; chest-girth, on inspiration 37¼ inches, expiration 32¼ inches, showing an increase of 2¼ inches; temperature normal; weight 10 stones 3 pounds. This patient is practically well. Still well.

"CASE X.—Patient has been losing weight for about twelve months, appetite very bad, cough very troublesome, hectic, perspiration at night; temperature 99.4°; height 5 feet 5 inches; chest-girth at ensiform cartilage, on inspiration 26½ inches, expiration 25¼ inches; very little movement, very little air entering; disease of both lungs. Sept. 18, has been to Hastings. Looks well, sleeps well, cough only occasional when exposed to cold, appetite wonderfully good, voice greatly improved, air entering freely, fair general movement; chest-girth, on inspiration 29½ inches, expiration 26¾ inches, showing an increase of 3 inches. Making splendid progress.

"CASE XI.—Saw this patient on the 10th of July. Disease of both lungs. Temperature 99°; expectoration colored, cough very troublesome, had been losing weight; chest-girth, on inspiration 26 inches, expiration 24¾ inches. Sent to Hastings. Sept. 29, looks very much better, little cough, appetite good, steadily putting on flesh, air freely entering, movement good; and chest-girth, on inspiration 28¼ inches, expiration 25¼ inches, being an increase of 2¼ inches. This patient is making most satisfactory progress.

"CASE XII.—Patient has extensive disease of both lungs. Hæmoptysis six years ago, and from time to time up to date. Has tried Madeira, Torquay, etc. Height 5 feet 7⅝ inches; chest-girth, on inspiration 25 inches, expiration 25¼ inches. Sept. 27, decidedly better, breathing much easier, more air entering generally, moist sounds clearing up; chest-girth, on inspiration 27½ inches, expiration 26⅝ inches, showing an increase of 2¼ inches. Going to Hastings. There is a little hope for this patient."

Further, the literature of consumption supplies us with a mass of evidence that clearly and unquestionably points to the accuracy of the above results. In the first place, an examination of the circumstances in which the numerous recorded cases of arrest, whether for a longer or shorter period, have taken place, shows that conditions that tend to obtain compensatory action by one or more of the other organs, those that tend to develop the lungs, or both associated together, were always present. Formerly arrests were sometimes obtained by the induction of an artificial skin-disease, by the use of counter-irritants, by bathing and sponging, and by preparations acting on the skin, kidneys, and digestive tract. Patients sent to hilly districts in the country, to the seaside, to warmer climates, where more time was spent out of doors, or to the mountains, have obtained an arrest of the disease, and similar results have fol-

lowed the taking-up of the trade of testing wind-instruments or practising various methods of inhalation.[1]

Not only have such conditions been invariably present where a temporary arrest has been effected, but they also, and especially those that tend to develop the lungs, have always been for a long time present in all the cases in which a complete cure has been obtained.[2] We know that men have completely recovered after following an occupation in the open air for many years, after long residence in mountainous districts, after many years spent in constant travelling, and after leading an active life on the borders of civilization in all parts of the world. Such are the thousands of happy results that have been so correctly described by Walshe as "Nature's cures." But there was a physician who could, and did, cure consumption by a definite method of treatment, as distinguished from the accidental nature of the recoveries above referred to, and that was Sydenham. He ordered his patients to continuously ride on horseback till they got well. This exercise was to be taken in the country, where the air was good; the riding was to be increased from seven to one hundred and fifty miles a day; and the patients were only to stop for food for themselves and horses, and not to remain more than one night in a place. And of this method of treatment he said, "I have put very many upon this exercise, and I can truly say I have missed the cure of very few."

Conclusions.

We are now in a position to state the case that has been laid before us. We have seen that the accepted theories of con-

[1] Ruehle (Ziemssen), Meckel, Powell, Ewart, Hanot (Jaccoud) Hirtz, Magnus Huss, Blake, Roger and Boudet, Heitler, Laennec, Cotton, Clark

[2] Frieund, Case in Royal Infirmary. Edinburgh (Lauder-Brunton) Cruveilhier, De Mussy, Fuentes, Harrhy, Stokes Ewart, Herman-Weber, Andrew. Austin Flint, Fuller, MacCormac, Germain Sée, Hastings, etc.

sumption must be rejected, because they either have no foundation in fact, or they do not accord with and are incapable of affording an adequate explanation of all the known facts of the case; and that Koch's theory falls within these categories. A new theory—that consumption is the direct result of the reduction of the breathing surface of the lungs below a certain point in proportion to the remainder of the body, and is solely produced by conditions that tend to reduce the breathing capacity—has been brought before us, and the following evidence adduced in its support:—

1. Consumption has been experimentally produced by conditions that tend to reduce the breathing capacity. Koch's successful experiments were directly produced by those conditions.

2. We can at any time watch the direct production of consumption by these conditions in the dust-inhaling trades.

3. The trades and occupations that directly compress the thorax, or impede the respiratory functions, are notorious for their production of consumption.

4. A large amount of consumption is produced in the army every year by those conditions.

5. Consumption has been repeatedly produced by confinement, both in man and in animals.

6. The children of consumptive parents who become diseased have been carefully brought up under such conditions.

7. Consumption bears the mark of the effects of the progressive action of such conditions from its commencement to its termination.

8. There is no recorded case of consumption, experimental or not, in which those conditions were absent.

9. Where such conditions are absent, there is no consumption in man or animal.

10. Upon their introduction, consumption immediately appears, both among men and in animals.

11. The disease presents a perfectly natural series of events when viewed in this light.

12. Its presence in our midst is due to the changes in our habits, mode of life and surroundings, that are being effected by the progressive advances of civilization.

13. Consumption has been prevented by the removal or counteraction of those conditions. The immunity of mountaineers is due to their capacious lungs.

14. The disease has been frequently arrested for a longer or shorter period by the accidental or deliberate adoption of measures that tended to compensate for or counteract those conditions.

15. And both the experimental and the practical application of measures that tend to compensate for and counteract those conditions have invariably been followed by the arrest and subsequent complete recovery from consumption, where the disease was not too extensive; and the same process has obtained in the thousands of cases of cure by nature and by Sydenham. Therefore this theory is founded on fact, and is both in strict accord with and capable of affording an adequate explanation of all the known facts of the case. And consequently we now have it in our power to secure, with absolute certainty, the prevention of and recovery from consumption. I have laid down the principles that must guide us in carrying out this work, and now it only remains for me to point out the directions in which we must move, in order to secure the general application of this knowledge, and the consequent practical suppression of consumption. The State loses the services of a large number of men every year from consumption in the army and in the various departments of the civil service. That not only represents a considerable financial loss, but in the case of the army it

also constitutes a serious source of danger to the State. The trades and occupations that produce so much consumption should be the subject of careful inquiry to ascertain how this production can be reduced to a minimum. That this inquiry is urgently called for, is evident from the following statistics, taken from the supplement to the "Registrar-General's Report," which show, that, out of a thousand deaths among various classes, there were from phthisis,[1] among Cornish miners, 690; earthenware-manufacturers, 473; printers, 461; file-makers, 433; cutlers, etc., 371; brewers, etc., 334; stone-quarriers, etc., 308; drapers, etc., 301; publicans, etc., 295; tailors, 285; cotton manufacturers, etc., 272; wool-manufacturers, 257; shoemakers 254; builders, etc , 252; carpenters, etc., 204; hosiery-manufacturers, 168; laborers (agriculture), 122; gardeners, 121; fishermen, 108; farmers, etc., 103

Physical education should be made a necessary part of our system of national education. We look to the government for action in the above directions, and their serious and immediate attention should be given to them. Life-assurance companies and sick-benefit societies can co-operate most materially in the prevention of consumption, and save their members considerable sums of money annually by insisting upon their members having or obtaining the required amount of lung development. And every available opportunity should be taken of placing before workingmen's clubs and societies the immense importance of physical development.

It is of great importance that the consumptive patient should be placed under treatment as soon as possible, and that it be uninterruptedly continued until the recovery is complete. For this purpose we require hospitals and institutions placed in the most favorable conditions in the coun-

[1] The disease is very rare among gypsies.

try and at the seaside, and I am sure the means will be gladly found for opening these institutions when once their necessity and immense importance have been realized. With such institutions, so placed, and this system of treatment thoroughly and continuously carried out, I am certain we shall have reduced the mortality from consumption to truly insignificant proportions before the next century has escaped from its infancy. And I have the right to express a clear and emphatic opinion on this subject; for I myself and my patients have unquestionably completely recovered from the disease. A great, a splendid, a noble victory over this disease lies in the hands of the profession. Shall we let doubt stand between us and its practical achievement?

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